

Environmental Effects on Women's Health

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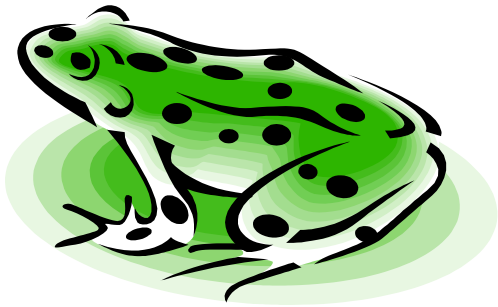
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85,000 synthetic chemicals registered for use in the US.

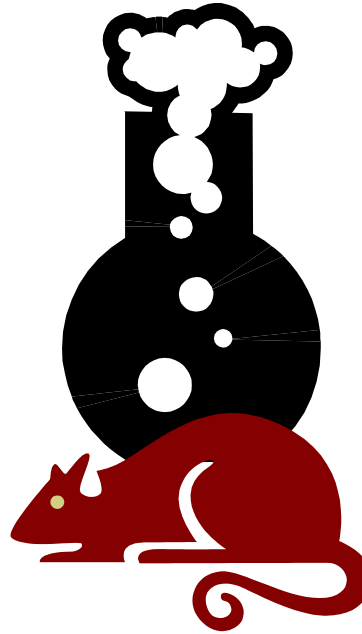
Human health is affected by:

- multiple chemical exposures
- simultaneous, overlapping/non-overlapping exposures
- low level vs. high level exposures
- duration of exposure
- exposure in utero vs. adult
- genetic context

Where do we get our information?



Wildlife

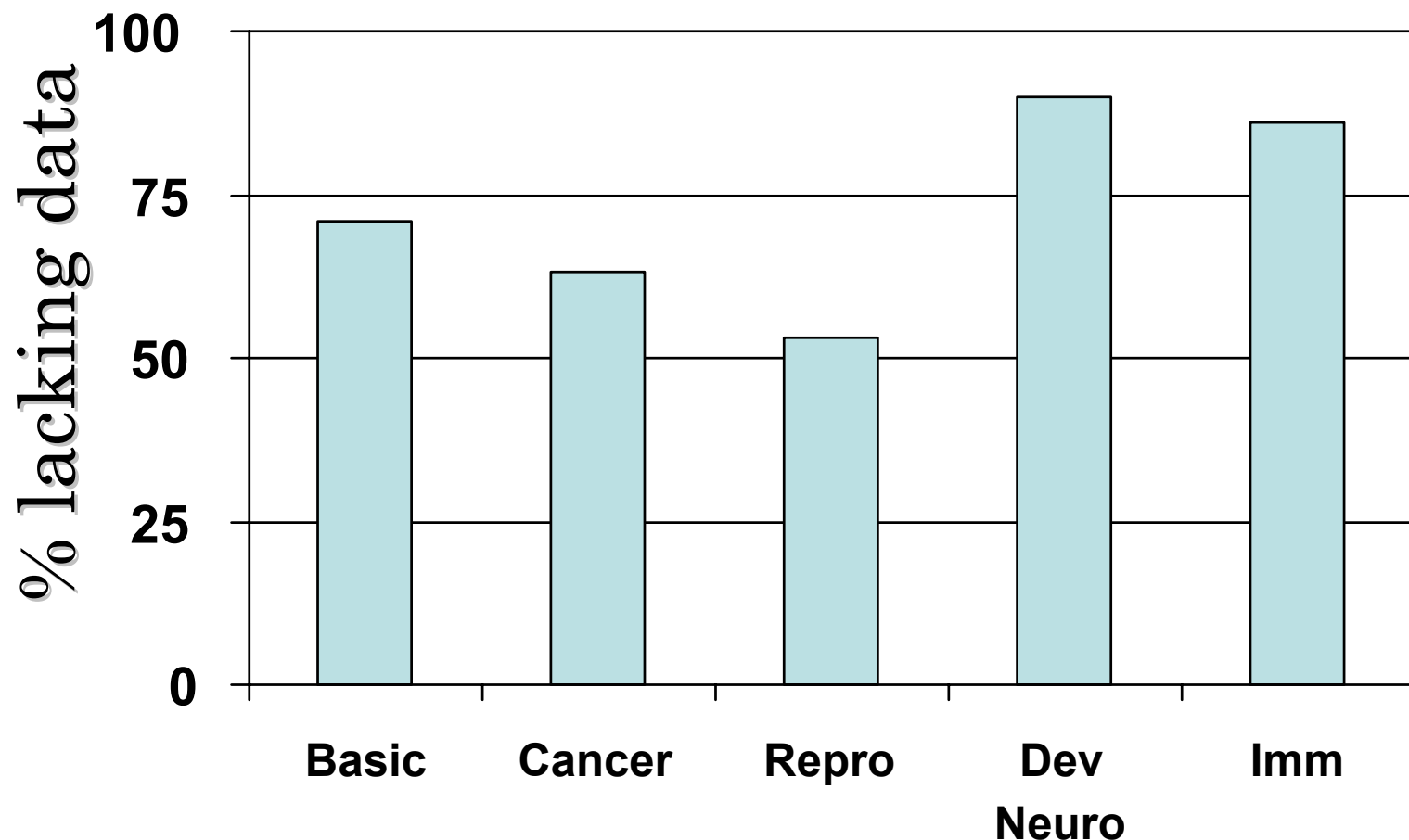


Laboratory



Humans

How Much Do We Know?



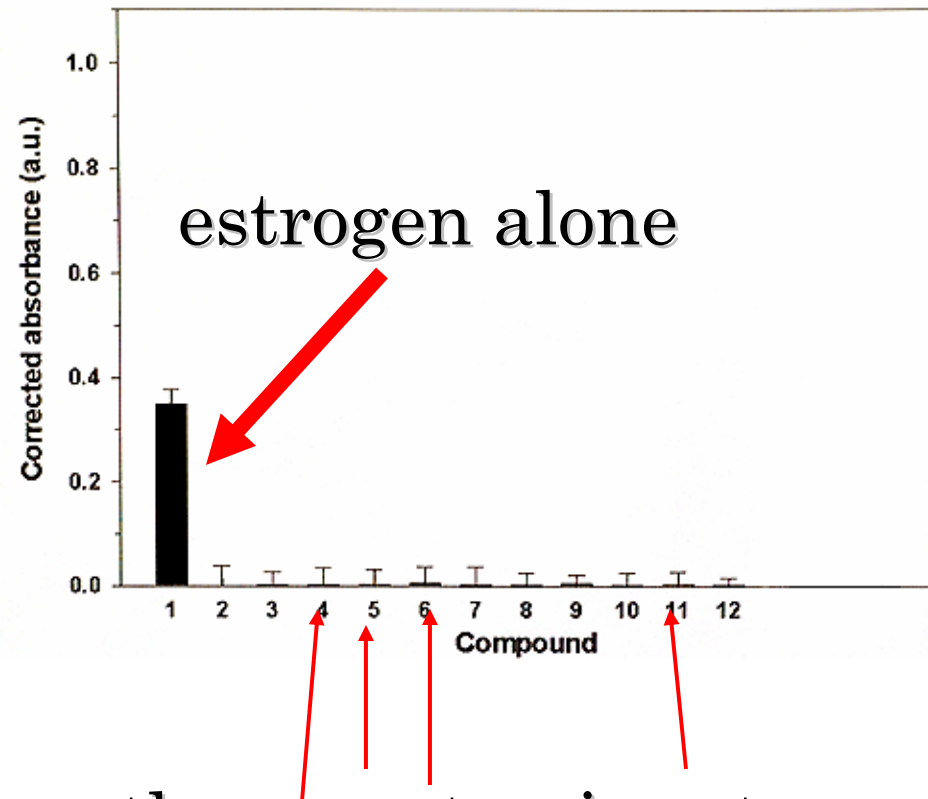
3000 high volume chemicals lack data

Biomonitoring
210 chemicals sampled:

[illegible]

Mixtures Are the Rule

Yet all regulatory standards to protect people are based on considering one chemical at a time.

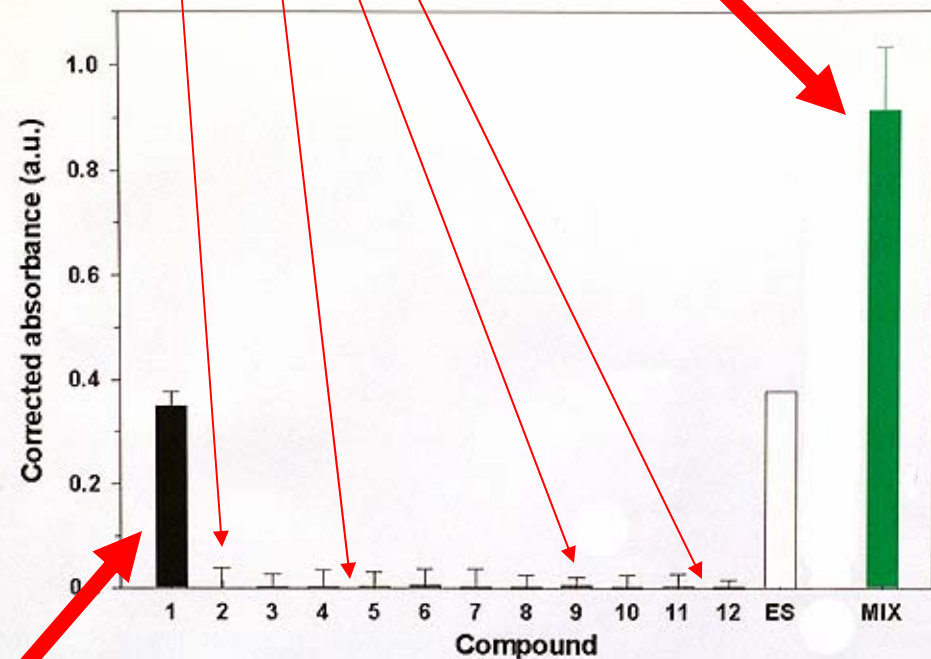


By themselves, these contaminants appear to have no effect.

Mixtures

Together these 11 contaminants
double the effect of estrogen

The impact of
mixtures can be
dramatically
greater than the
effects of chemicals
one by one.

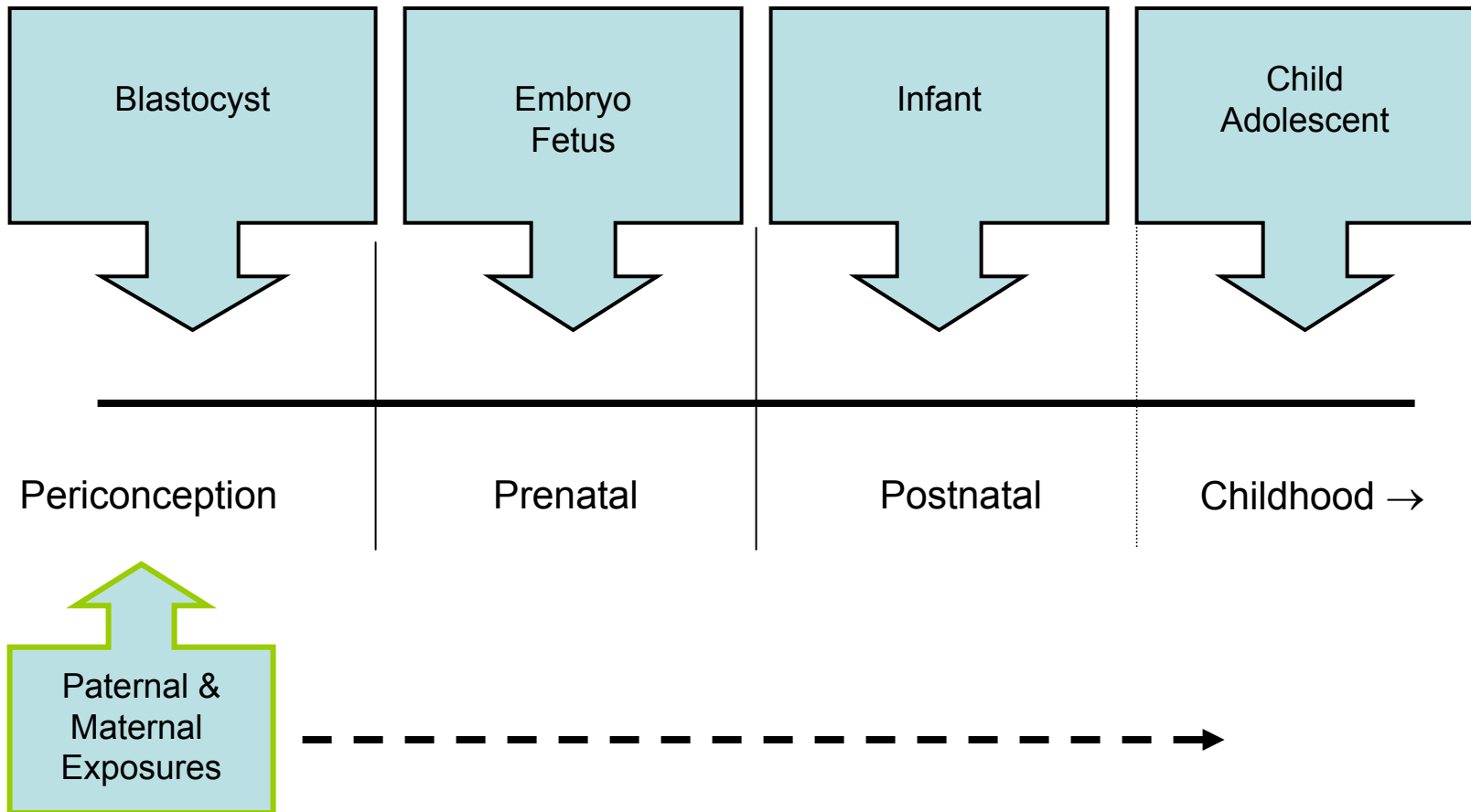


estrogen alone

The absence of human data is not
proof of safety.

It is proof of the lack of data.

Critical Windows



INFERTILITY

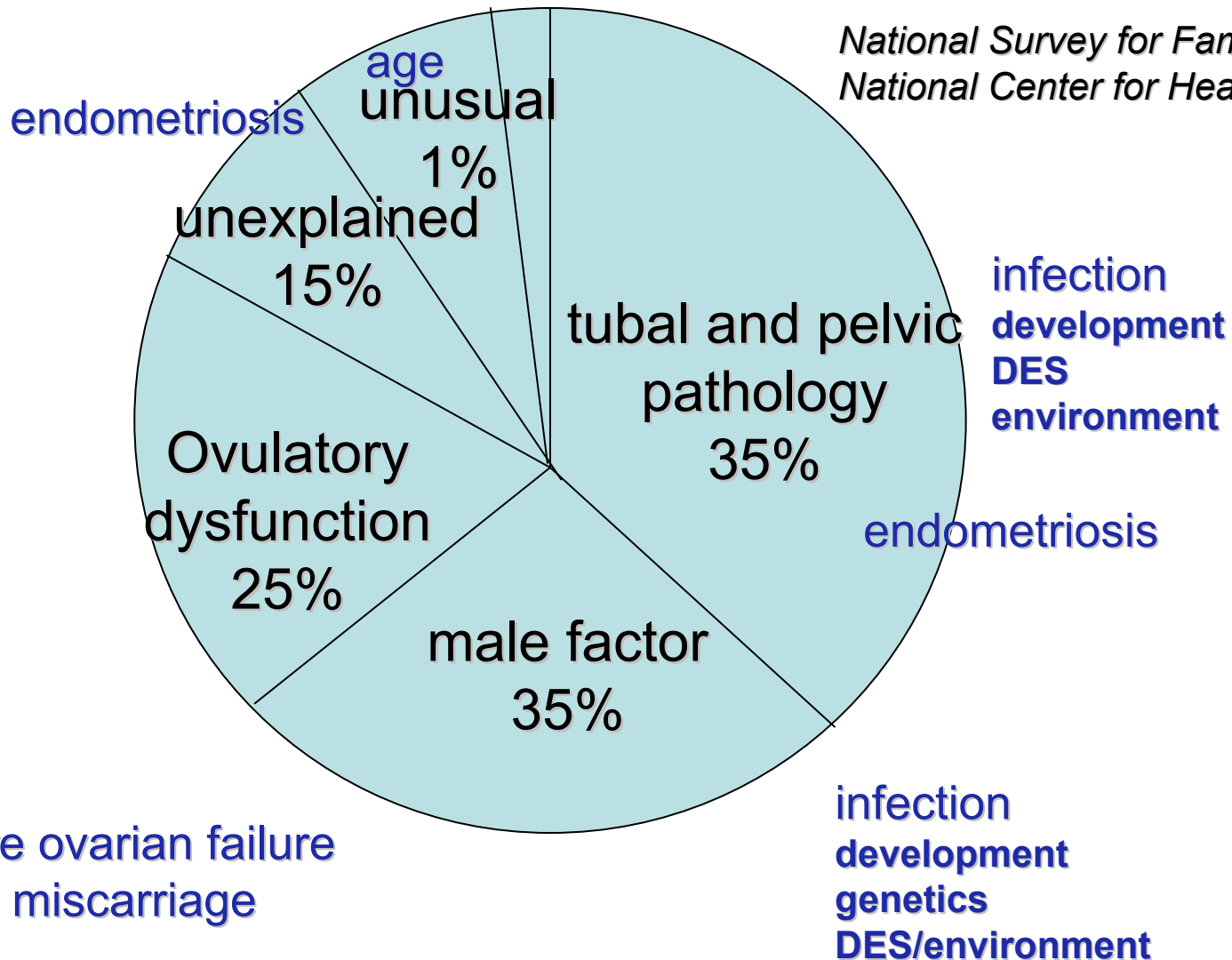
2002 - 12%

1995 - 10%

1988 - 8%

1982 - 8%

*National Survey for Family Growth
National Center for Health Statistics*



Environmental Contaminant Effects on Reproductive Health and Fertility

Some of the culprits

- Heavy metals - lead, mercury, cadmium, arsenic
- Solvents
- Pesticides, herbicides, fungicides
- Dioxins
- PCBs (electrical transformers)
- PBDEs (flame retardants, computers, furniture, clothes, carpets).
- PVCs and plastics

phthalates - plasticizers to soften plastics (shower curtains, vinyl floor coverings, plastic wraps, makeup, lotions, shampoos, nail polish, adhesives, IV bags, building materials, gelatin pill capsules).

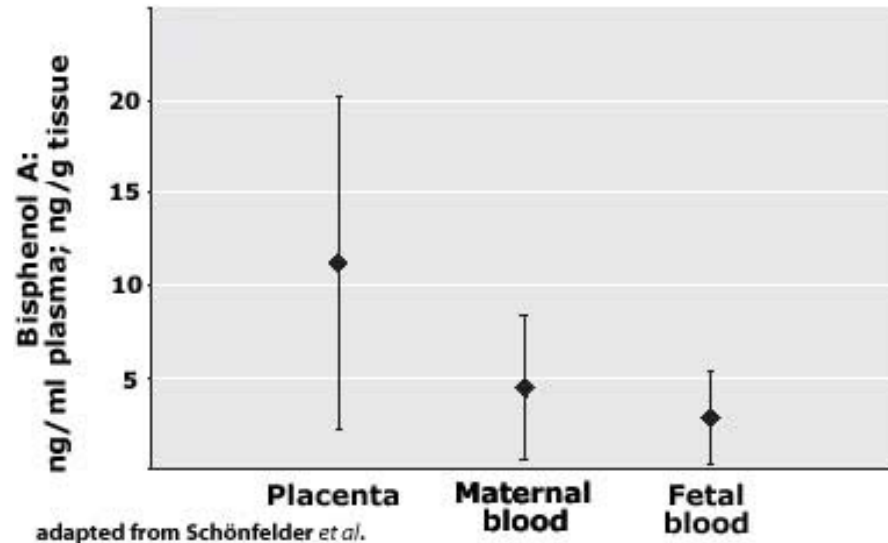
bisphenol A - plastic monomer in hard polycarbonates: sports bottles, baby bottles, dental sealants, food and milk carton lining, CD covers, glasses, lenses.

PFCs in Teflon

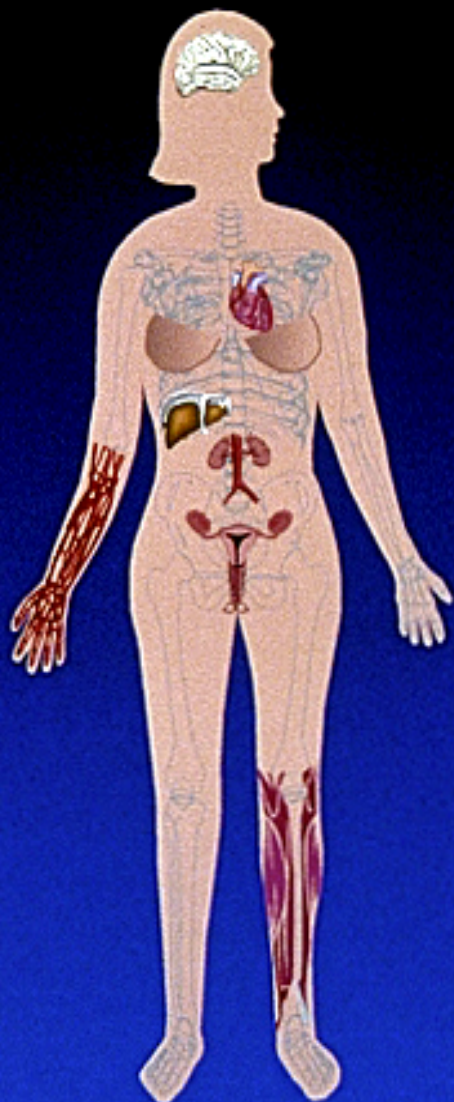
EDCs & Human Health

- Modulate hormonal function
- Environmental Estrogens: Examples
 - Pesticides
 - DDT, methoxychlor (HPTE), dimethoate, chlordane, lindane
 - PCBs and their metabolites
 - Alkylphenols (detergents)
 - Bisphenol A (polycarbonate plastics, epoxy resins)

Background exposure to Bisphenol A



Target Tissue Effects of Ovarian Hormones in Women



Target Tissues

- Brain
- Skeleton
- Bone marrow
- Heart and arteries
- External genitalia
- Ovaries
- Breasts
- Muscle
- Skin and hair
- Liver
- Kidneys

Endocrine Disrupting Chemicals

- Puberty
- Menstruation
- Endometriosis
- Time-to-pregnancy
- Pregnancy loss
- Reproductive Cancers

Toft et al., 2004

Human Studies

Environmental Exposures: Women

- Infertile women are 27 times more likely to have mixed or used **herbicides** within 2 yrs of attempting conception (Greenlee 2003).
- Women born 30 yrs ago with high **DDT** metabolites in their cord blood (thus in utero exposure) have longer times to pregnancy later in life (Cohn 2003).
- Women in the Air Force exposed to **aromatic hydrocarbons in fuels and solvents** show altered menstrual cycles and significantly lower LH levels (Reutman, 2004).
- Wives of Great Lakes sport fishermen who consume **PCB**-laden fish have longer time to pregnancy (Buck et al, 2002).

Environmental Exposures during Pregnancy

- A woman's risk of fetal loss, still birth and bds increases, the closer she lives to an area of agricultural spraying with **pesticides** (Bell, et al, 2004)
- **Phthalates** in women linked to preterm birth and precocious puberty (Shearle and Franks 2004).
- **PCBs**, other organochlorines, and **fine particulate matter** are linked to LBW and prematurity (Bobak 2000)
- **Bisphenol A** associated to pregnancy loss in animals and small human study

Prenatal Exposure to DES



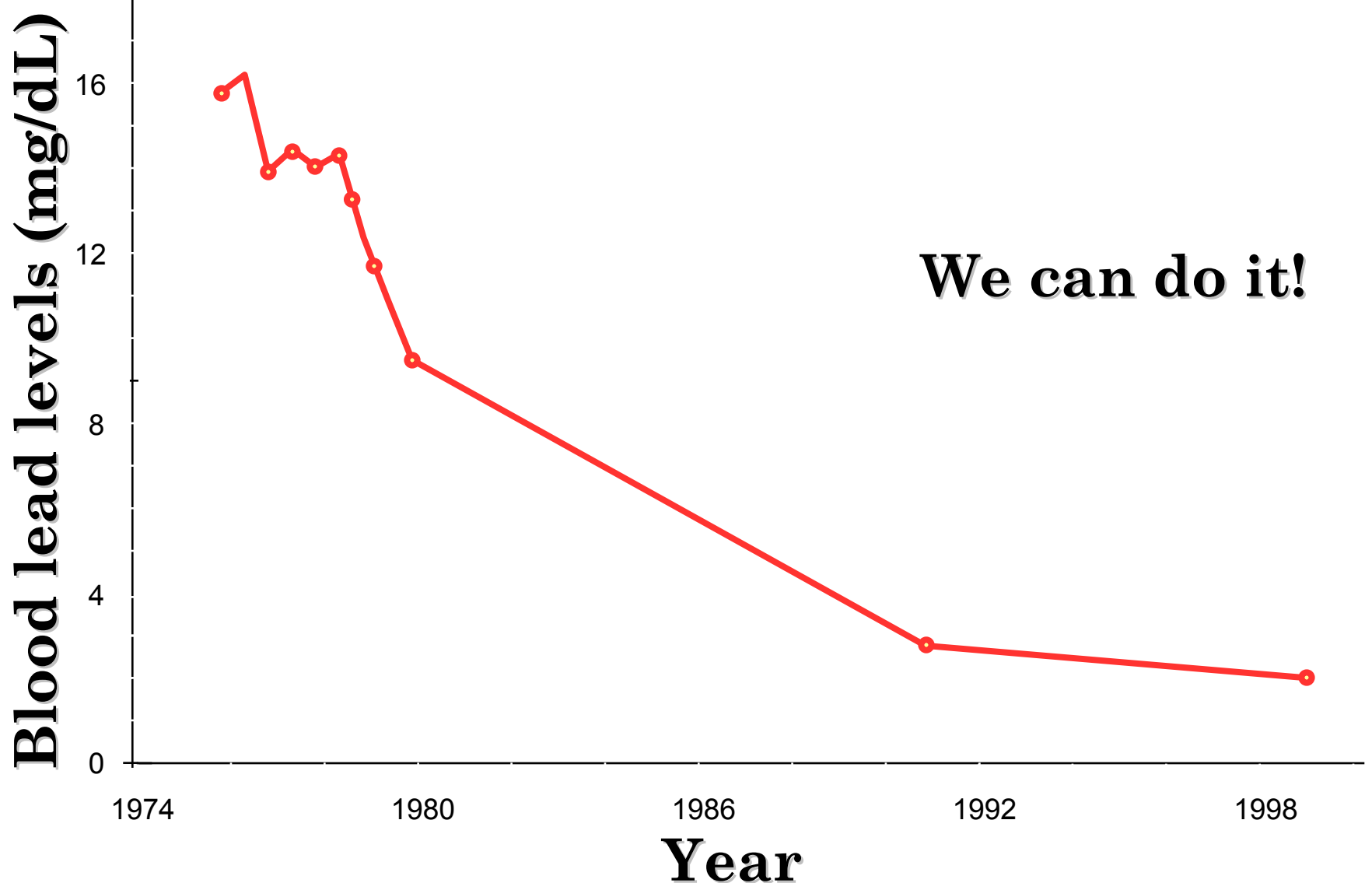
A DES Ad from 1957

- DES widely prescribed late 1940s - 1970s for treatment of threatened miscarriage.
- Considered safe and effective
- Estimated 2-8 million births effected
- Adverse effects in **children**;
 - Vaginal cancer in female offspring (<.1%).
 - Reproductive tract dysfunction in male & female offspring (>90%).
- Adverse effects in **grandchildren**;
 - Menstrual irregularities, ovarian cancer
 - Hypospadias (deformed penis)

DES leads to concern for other chemicals

- Prenatal exposure to
 - Phthalates increases deformities of the penis and testicles in animals
 - Bisphenol A in animals increases risk of infertility in daughters
 - Perfluorinated chemicals in animals increases risk of premature mortality

Blood lead levels in the U.S.



Source: CDC. National Report on Human
Exposure to Environmental Chemicals, March 2001

UCSF Program on Reproductive Health and the Environment

Vision

Advancing healthy conceptions, pregnancies, children and adults.

Mission

To advance scientific inquiry, professional training, citizen education, and health policies that reduce the impacts of environmental contaminants on reproductive and developmental health.

Web Resources

www.CHEforHealth.org

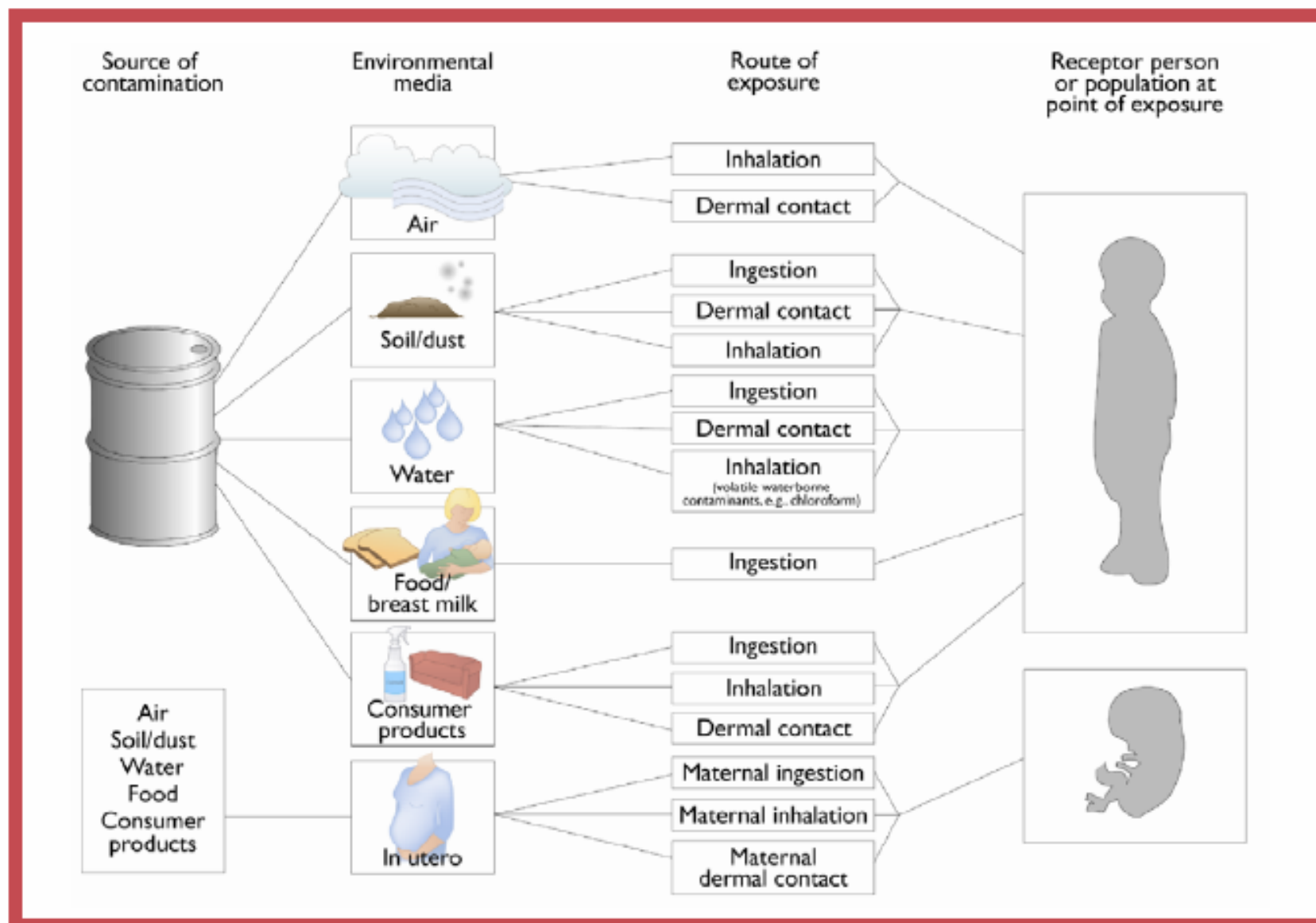
www.ProtectingOurHealth.org

www.OurStolenFuture.org

www.EnvironmentalHealthNews.org



Figure 2: Major Pathways of Human Exposure to Environmental Contaminants



Source: Adapted from Health Canada, 1998.

Program Areas

- **Basic and epidemiologic research**
 - Expanding our knowledge
- **Policy and Healthcare**
 - Working toward improved health policy
- **Education**
 - Educating the current and next generation of environmental health professionals

UCSF – CHE Summit on Environmental Challenges to Reproductive Health and Fertility January 28-30, 2007 at UCSF

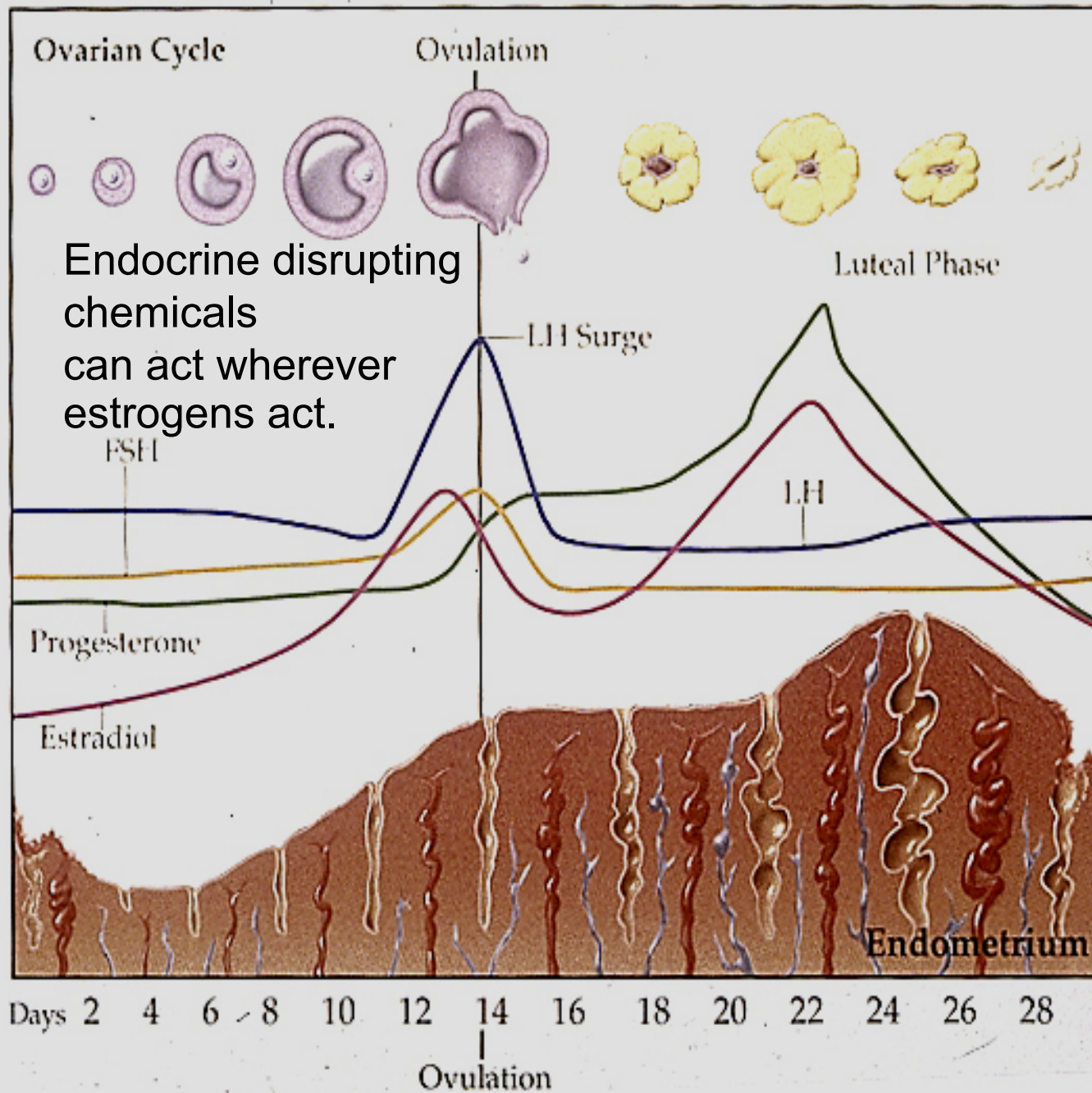
- Convey state of the science of environmental impacts on reproductive health
- Identify
 - What clinicians and other health care providers need to use the current science.
 - Key next steps in the research agenda and questions the research can answer
 - Key next steps in policy that should be taken
- Launch UCSF's new Program on Reproductive Health and the Environment

Can We Afford to Wait?

The health of our citizens is at stake:
Men, women, and children.
The future generation is most
vulnerable and most at risk.

The time to act is now!

Menstrual Cycle



Development Begins at Fertilization

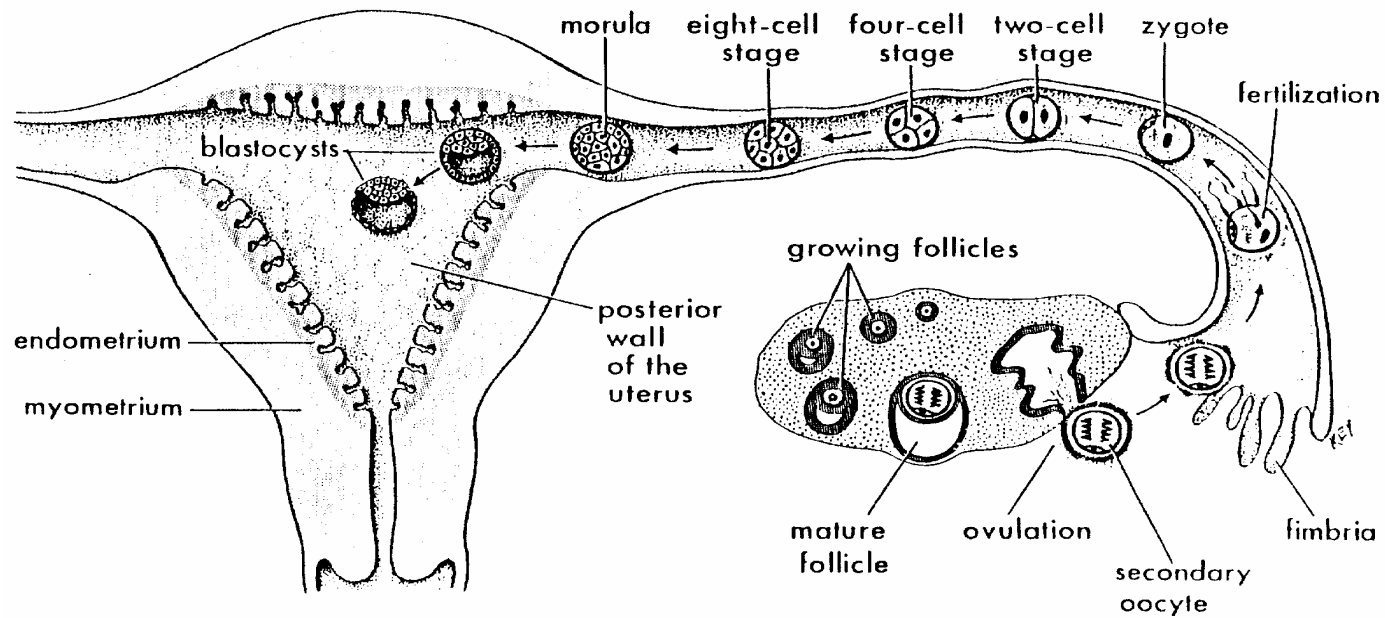


Table 1: Reported responses to di-*n*-butyl phthalate in the rat and human: a comparison of ‘phthalate syndrome’ and ‘testicular dysgenesis syndrome’

Response	Rat	Human
Components of testicular dysgenesis syndrome^a		
Hypospadias	Identified	Inconclusive ^b
Cryptorchidism	Identified	Inconclusive ^b
Impaired spermatogenesis	Identified	Identified ^c
Testicular Cancer	Identified: Leydig cell cancer	Inconclusive: Germ cell cancer ^b
Additional components of phthalate syndrome		
Testicular dysgenesis ^d	Identified	Identified
Reduced anogenital distance	Identified	Identified ^c
Lowered testosterone or androgen activity	Identified	Identified ^c
Retained thoracic nipples	Identified	Not applicable
Delay in preputial separation	Identified	Not studied

a) As defined by Bay et al. (2006).

b) Nonspecific exposure metrics, such as job matrices, were used in available studies.

c) Response has been identified, but only a very small number of study or studies have done so.

d) This is typically expressed in tissues (cancerous and non-cancerous) among humans with germ cell cancer and is expressed in tissues among rats with Leydig cell cancer.

Data in table reported by (Bay et al. 2006; Fisher et al. 2003; Foster 2006; Hauser and Calafat 2005; Lottrup et al. 2006; Pan et al. 2006; Skakkebaek et al. 2001)

***From E. Wells et al. in process**

Next Steps

- RESEARCH
- POLICY
 - Improved testing for chemicals
 - Better policies for reducing harmful exposures
- EDUCATION
 - Postsecondary and professional
- COMMUNICATION
 - Public and policy makers